## Green, Michelle

**From:** Miller, Scott
**Sent:** Thursday, October 22, 2015 2:57 PM
**To:** Saskowski, Ronald
**Subject:** FW: Final Sap addendum 7 SMS RD
**Attachments:** SAP addendum 102215 transmittal.pdf; SMS Final SAP Addendum 7 Complete.pdf

Hello Ron,
Please save this to SEMS for Smokey Mountain Smelters.
Thank you,
Scott

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**From:** Ostrofsky, Arnold [mailto:Aostrofsky@versar.com]
**Sent:** Thursday, October 22, 2015 2:46 PM
**To:** Miller, Scott <Miller.Scott@epa.gov>
**Subject:** Final Sap addendum 7 SMS RD

Scott,

The transmittal letter and the final version of the SAP Addendum 7 for the Smokey Mountain Smelters Site is attached. This Addendum details the additional surface and subsurface soil sampling, monitor well installation and groundwater sampling planned for the site. We have incorporated the comments from the meeting we held yesterday.

Please let me know if you have any questions or comments.

Thank You

**Arnold Ostrofsky, P.E.**
**Program Manager**

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RACII Lite 0601

Contract No. EP-S4-08-03

October 22, 2015

Scott Miller, Remedial Project Manager
EPA Region 4, Superfund Branch
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Subject: Transmittal of Final Sampling and Analysis Plan Addendum 7
Smokey Mountain Smelters Site – Task Order 047; Contract No. EP-S4-08-03

Dear Mr. Miller:

Attached is an electronic version (PDF) of the Final Sampling and Analysis Plan Addendum 7 for the Smokey Mountain Smelters Site in Knoxville, Tennessee. This SAP details the additional soil sampling and installation and sampling of new groundwater monitoring wells planned at the Site. This Final version also incorporates the comments we discussed during our October 21st meeting with Superfund Scientific Services Section and the Tennessee Department of Environment and Conservation. Specifically we included additional surface and subsurface soil samples in the area surrounding the former process building.

If you have any questions or comments on this matter, please contact me.

Very truly yours,

Arnold Ostrofsky

Arnold Ostrofsky, P.E.
Project Manager

Attachments

C: M. Miller – J. M. Waller

# Addendum 7 to Sampling and Analysis Plan for the Remedial Investigation / Feasibility Study of Smokey Mountain Smelter Site, Knoxville, Knox County, Tennessee (Dated April 2011)

**October 2015**

## Introduction

J. M. Waller Associates, Inc. (J. M. Waller) has prepared this Addendum as an update to the Smokey Mountain Smelters (SMS) RI/FS Sampling and Analysis Plan (SAP) Volume 1, Revision 1, Field Sampling Plan (FSP) and Volume 2, Revision 1, Quality Assurance Project Plan (QAPP) both dated April 2011. This addendum describes proposed additional monitor well installation and sampling and subsurface soil sampling to be performed in order to assess the groundwater flow direction, groundwater contaminant levels, and subsurface soil contaminant levels.

The Addendum is organized by referencing the appropriate section in the April 2011 SAP and providing the new text for changing or inserting. The goals of this field investigation will be to;

1. Collect 44 subsurface soil samples from the area surrounding and encompassing the Former Settling Ponds to further delineate the vertical extent of contamination in this area and in the area around the former processing plant. These samples will assist in determining the area of the planned cap.
2. Install additional monitor wells to serve as piezometers to refine the groundwater potentiometric surface/gradient model, and to collect groundwater samples representative of shallow and fractured rock groundwater flow zones to determine concentration of contaminants.

## Section 4.3.1 Additional Surface and Subsurface Soil Sampling

Subsurface soil sampling shall be conducted around the vicinity of the Former Settling Ponds which lies in the center of the site and the eastern boundary of the installed cap area and surface and subsurface soil sampling will be conducted at the former processing plant (Figure 1). Samples shall be collected using a rotasonic drill rig in order to penetrate the various types of debris beneath the surface. 44 samples shall be collected from the subsurface soil to delineate the vertical extent of contamination and attempt to locate a possible continuing source of contamination. All soil samples will be collected in accordance with the SESD Operating Procedure for Soil Sampling (SESDPROC-300-R1) and based on the XRF screening value.

## Section 4.4.1 Monitor Well Installation/Construction Field Oversight

J. M. Waller will conduct oversight of a drilling contractor during field investigation to ensure that all drilling related field investigation tasks in accordance with the EPA Region 4 *Field Branches Quality System and Technical Procedures unless otherwise stated in the SAP*. J. M. Waller will also oversee the surveyor subcontractor to locate the new wells.

A J. M. Waller field geologist will oversee the drilling and surveying subcontractors, and will complete boring logs, well construction diagrams, and other pertinent field logs for each drilling location. Up to seven monitoring wells will be installed via a combination of rotasonic and rotary coring drilling techniques. Of the seven proposed well installations, six wells will be installed as collocated shallow and deep well pairs, with a shallow single cased well screened above bedrock to sample surficial groundwater, and a deep, double cased well cased into fractured yet largely competent carbonate bedrock, and screened to sample the first sizable water bearing fracture encountered. The seventh proposed well (MW8B) will consist of a double cased well, as previously described, to pair with the existing well, MW8A.

Continuous cores will be collected from the ground surface to completion depth of each boring for logging/soil and rock characterization purposes.

Figure 2 depicts the proposed drilling locations. All proposed wells, including MW8B, allow for contemporaneous potentiometric surface gauging and comparative chemical analysis of shallow groundwater and deeper groundwater present in bedrock fractures. Well pairs MW14A/B, MW15A/B, and MW16A/B are located to improve lateral spacing with respect to the current groundwater flow axis in an effort to refine the gradient induced potentiometric head model, outside the lineated arrangement provided by the current array of monitoring wells.

Monitor Well Installation will be performed in accordance EPA Region 4 Science and Ecosystem Support Division (SESD) Field Branch Quality System Technical Procedures (FBQSTP) Guidance *Design and Installation of Monitoring Wells (SESDGUID-101-R1)* dated January 2013, as amended or modified. Each of the new monitor wells shall be installed in separate borings. Basic construction design details for the proposed wells include:

Surface casing (where necessary) will be constructed of 6-inch inside diameter (ID), machine threaded sections of Schedule 40 PVC pipe. Surface casing will be installed via the plunger method, using a pre-cured grout plug in the terminal end of the casing to insure a good grout to formation bond. Drilling through the grout plunger and into the formation below will occur no earlier than 24 hours after grouting.

Well screens will consist of 10 to 20 foot sections of 2-inch ID, machine threaded, Schedule 40 polyvinyl chloride (PVC) screen with 0.01 inch slotted openings. The bottom of the well will terminate with a threaded Schedule 40 PVC end cap. The remaining well riser casing will consist of machine threaded sections of 2-inch ID, Schedule 40 PVC riser which will extend from the top of the screen to the ground surface.

Filter packs will surround the screen in the well annulus to at least 2 feet above the top of the screen. Filter material will consist of 20-30 mesh sand or product with similar gradation. Filter pack grain size analysis shall be reviewed by the J.M. Waller field geologist prior to installation to determine the suitability for use with the specified 0.010 inch slotted screen openings. The depth of the filter pack will be measured with a weighted depth tape prior to emplacement of the annular seal.

Annular seals will consist of a minimum of a 2 foot thick layer of one-quarter inch diameter bentonite pellets. The seal will be placed above the screen and hydrated with for a minimum of 60 minutes or longer (in accordance with the manufacturer's instructions) prior to grouting. Depth of the hydrated seal will be verified with a weighted depth tape prior to grouting.

Borehole backfill (if required) shall consist of bentonite pellets. Filter sand shall extend at least two feet below the top of backfill and the lower terminus of the well casing/screen assembly.

Annular filler will be placed into the borehole annulus from the bottom up via pressure methods and a tremie pipe. Grout will be of the bentonite-cement type, mixed in the proportions 94 pounds (lbs) Type I Portland Cement, 6 gallons of potable water, and no more than 2 lbs bentonite powder to yield a grout slurry of at least 15 lbs/gal. Grout density will be verified using a grout scale during mixing of individual batches, and upon circulation from the borehole.

Monitoring wells will be completed with 2 foot by 2 foot by 6 inch thick concrete surface pad and a traffic-rated "flush-mount" manhole. The concrete pad will be flush with existing grade at the edges and tapered such that water will run off of the pad and mechanical equipment such as lawnmowers may be operated over the well without damage to the well or motorized equipment. Each well will be fitted with a sealing cap and a keyed padlock. Manhole covers will be fitted with 3/8 inch hex key (Allen) head bolts, consistent with existing installations.

All drilling fluids, purge water, and decontamination fluids generated during the well installation will be containerized and staged onsite pending characterization and ultimate disposal at a permitted waste treatment and storage facility via a licensed waste transporter. Temporary waste holding vessels will include weatherproof covers to prevent precipitation runoff.

### Section 4.4.2 Well Development

The monitor wells will be developed after installation to remove fines and sediments from around the well screens and to remove drill cuttings and residual drilling fluids from the area around the monitored interval of the boring. EPA guidance *SESDGUID-101-R1*, as amended or modified, will be followed for well development procedures.

Development will be conducted by the driller not less than 24 hours after completion of the annular space including grout placement. Completed well development methodology will include mechanical surging and overpumping to produce well effluent of low turbidity and stable geochemical parameters including specific conductance, dissolved oxygen, pH, and oxidation reduction potential as determined via field instrumentation. Stabilization criteria described in EPA Region 4 Field Science and Ecosystem Support Division Operating Procedure: Groundwater Sampling *(SESDPROC-301-R3)* (EPA, 2013) will be applied to well development at relatively high flow rates to demonstrate that the well effluent is representative of formation water in preparation for later sampling events.

Table 4-1 provides the Sample locations and rationale and 4-2 provides the proposed analytical methods.

### Section 4.14 Project Schedule and Deliverables

**TABLE 4-3: Project Schedule**

Smokey Mountain Smelter Site

| TASK NO. | DESCRIPTION | START DATE | DURATION in Days | FINISH DATE |
|---|---|---|---|---|
| 300 | Field Investigation | 12/1/15 | 12 | 12/15/15 |
| 400, 500 | Sample Analyses & Data Validation | 12/15/15 | 20 | 1/15/16 |
| 612 | Data Evaluation | 1/15/16 | 10 | 1/30/16 |
| 700 | Treatability Study/Pilot Testing | 2/15/16 | 120 | 7/15/16 |
| 800 | Preliminary Design | 3/1/16 | 30 | 4/15/16 |
| 1100 | Pre-Final Design | 6/1/16 | 30 | 8/1/16 |
| 1400 | Task Order Closeout | 9/15/16 | 15 | 9/30/16 |

**Notes:**
1. Initiation of field investigation task is dependent on approval of the SAP Addendum 7.
2. Completion of data evaluation is dependent upon timely receipt of validated data from the EPA.

### Section 5.1.2.3 Additional Soil Sampling

Samples will be collected from the locations shown on Figure 1.

The locations where both surface and subsurface soil are planned to be collected are designated on the Figure 1.

Samples shall be analyzed for TAL Metals and will be submitted to EPA Region 4 ASB or the designated CLP Laboratory for analysis. The following procedure will be used to obtain subsurface soil samples from the rotasonic macro-core.

1. With stainless steel bowl and sampling equipment immediately available, don uncontaminated gloves and prepare sampling log sheet with pertinent information.
2. Record XRF reading from each sample core. Take a reading at each foot in the 10 – 20 ft. interval possibly as deep as the capillary fringe. The exact depth for XRF reading will vary based on location and visual observations. The plan is to try and locate the bottom of the former ponds. In the area surrounding the former process plant XRF readings will be taken at five foot intervals.
3. After XRF has been recorded, collect a portion of a discrete sample from the interval with the highest XRF reading and place in stainless steel bowl.
4. Homogenize the sample in the stainless steel bowl with a stainless steel spoon.
5. Transfer soil to appropriate sample containers and place in designated sample coolers.
6. Samples shall be chilled to 4 ± 2° C or less without freezing in iced coolers.
7. Label, pack, and ship samples in accordance with the SESD Operating Procedure for Packing, Marking, Labeling, and Shipping of Environmental and Waste Samples (SESDPROC-209.R1).
8. Document the entire sampling process in the field logbook in accordance with the SESD Operating Procedure: Logbooks (SESDPROC-010-R3).

### Section 5.1.3.1 Monitor Well Groundwater Sampling

After newly installed wells have been developed a synoptic round of water levels should be performed on all monitor wells throughout the site. Groundwater samples shall be collected from each of the seven newly installed shallow monitor wells shown on Figure 2 in this Addendum 7. Samples will be submitted to EPA Region 4 ASB or the designated CLP Laboratory for analysis of TAL Metals and alkalinity. Groundwater samples shall be collected according to *SESDPROC-301-R3*, *Groundwater Sampling* and follow the procedures below:

<u>WELL PURGING LOW FLOW/LOW STRESS PROCEDURE</u>

1. The depth to water in the well will be measured and recorded to the nearest 0.01 feet, via electric water level meter.

2. The required length of tubing will be calculated, measured, and attached to the peristaltic pump, such that the intake is placed at the midpoint of the saturated screened interval. Note that the tubing will be measured to allow a minimum distance between the wellhead and the discharge point (field testing equipment), to minimize temperature changes in the groundwater discharged from the well. Teflon® or Teflon®-lined tubing will be used and disposed of after sampling is complete.
3. The tubing will be slowly and smoothly lowered to the required depth to minimize the amount of mixing in the well. The discharge tubing will be secured to the well casing (or PVC stick-up) to minimize movement.
4. The field-testing equipment will be placed as close as possible to the well head/discharge tubing.
5. The pump will be connected to the power supply (battery or other power source, and the power supply turned on (without starting the pump).
6. The depth to water with the tubing in the well will be re-measured and compared with the initial reading; if the readings vary by greater than 0.05 feet, field personnel will wait for five minutes, re-measure the water and begin pumping.
7. The pump will be started at the lowest flow setting (attempt 100 to 200 milliliters per minute). The pump start time will be recorded. (Note that during the initial period of pumping, an estimated initial 5 to 10 minutes, the depth to water in the well should be measured frequently (at an estimated frequency of approximately once per minute), to enable timely pump flow adjustments to attempt to minimize significant drawdown in the well). The drawdown in the well will be maintained during pumping to 0.3 feet or less, by adjusting the pump flow rate.
8. The initial groundwater sample discharged from the tubing will be collected and field parameters (pH, temperature, conductivity, turbidity, salinity, and dissolved oxygen) will be measured and recorded, as well as the time.
9. These field parameters (pH, temperature, conductivity, turbidity, salinity, and dissolved oxygen) and the depth to water in the well (using the M-scope) will be measured at five-minute intervals (initially the water level will be measured more frequently, as discussed in step 7 above). The data and the associated time will be recorded on the low-flow sampling data sheet. Attempts will be made to maintain the drawdown in the well during pumping to 0.3 feet or less, by adjusting the pump flow rate. Drawdown for each well will vary depending on the recharge capacity of the well. Drawdown may exceed 0.3 feet in some or all wells.
10. Following the stabilization of measured field parameters, groundwater samples will be collected. "Stabilization" is considered to be achieved when three consecutive readings, taken at three (3) to five (5) minute intervals, are within the following limits:
    - Turbidity (10% for values greater than 10 NTU)
    - DO (10%)
    - Temperature (3%)
    - pH (+/- 0.1 unit)

All measurements, except turbidity, must be obtained using a flow-through cell. The minimum purge volume is two (2) times the stabilized drawdown volume plus the extraction tubing volume. If parameters do not stabilize, then it should be noted in the logbook.

All pertinent field data will be recorded on Sample Log Sheets and referenced in the field logbook. Appropriate chain-of-custody procedures will be followed using the Scribe software package. Samples will be labeled, preserved, packed and shipped according to Section 5.2.2 of the SAP and CLP requirements. A monitor well sample log sheet is included as an attachment.

**Section 5.2.1.1 Former Settling Pond Sample and Former process Building Designation**
Each sample collected from the Former Settling Pond will be assigned a unique sample identification number. Any other pertinent information regarding sample identification will be recorded in the field logbooks and/or sample log sheets. MS and laboratory duplicate samples will be designated on the field documentation forms including the COC.

- Former Settling Pond locations: SMSSPSB##-TD-BD

Where:
SMS = Smokey Mountain Smelters
SP = Settling Pond
PB= Process Building
SB = Subsurface Soil
## = sequential number
TD = Top Depth for the sampling interval (in ft bgs)
BD = Bottom Depth for the sampling interval (in ft bgs)

All other sample identification will be as indicated in section 5.2.1 with the exception of Field Duplicate which will be labeled with an X after the sequential number. Specific depths of samples will also be noted in the field logbook, on associated field sampling forms, and in the Scribe data management software.

FIGURES


## Legend

- Proposed Subsurface Soil Sample
- Proposed Surface and Subsurface Soil Sample
- Railroad Tracks
- Railroad ROW
- Abandoned Railroad Spur
- Montgomery Village Apts.
- SMS CAP Area (Footprint of former process building)
- SMS CAP Area 2 (Footprint of the former waste area)
- Former Structure
- Waste Pile
- SMS Approx Site Boundary
- Temporary Gravel Road
- Former Settling Ponds
- Pond
- Surface Water Pathway

N

Feet

0 90 180 360

WGS84


SMOKEY MOUNTAIN SMELTERS
KNOXVILLE, KNOX COUNTY, TENNESSEE

**FIGURE 1**
**Proposed Soil Samples**

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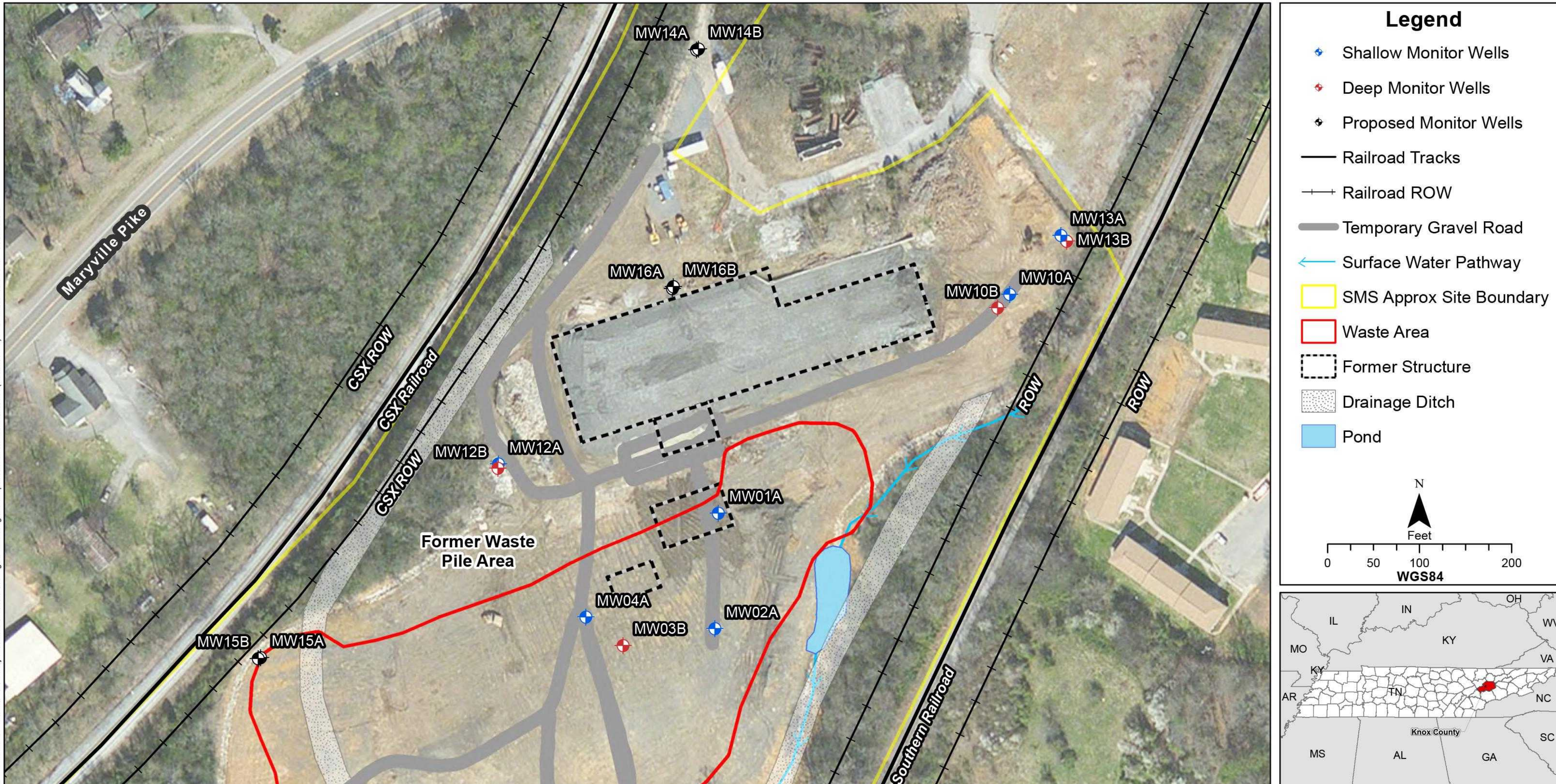


SMOKEY MOUNTAIN SMELTERS
KNOXVILLE, KNOX COUNTY, TENNESSEE

**FIGURE 2**
**Existing and Proposed Monitor Well Locations (Addendum 7)**

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Path: Y:\EPA RAC II Lite\TO 19 Smokey Mountain Smelters\GIS\Figure 2 Existing and Proposed Monitor Well Locations (Addendum 7).mxd Date: 10/5/2015 User: hcoats

# TABLES

Table 4-1
Sample Location and Rationale Summary
Smokey Mountain Smelters
Knoxville, Knox County, Tennessee

| Location ID | Sample Code | Sample Location | | Activity | Rationale |
|---|---|---|---|---|---|
| | | Longitude | Latitude | | |
| **Groundwater** | | | | | |
| SMSMW14A | SMSMW14A | 35.920086 | -83.926583 | TAL Metals including Mercury, Hexavalent Chromium, Cyanide, chloride and alkalinity | Characterize groundwater contamination and collect addional information to determine groundwater flow direction. |
| SMSMW14B | SMSMW14B | 35.920089 | -83.926575 | | |
| SMSMW16A | SMSMW16A | 35.919377 | -83.926699 | | |
| SMSMW16B | SMSMW16B | 35.919383 | -83.926695 | | |
| SMSMW15A | SMSMW15A | 35.918315 | -83.928251 | | |
| SMSMW15B | SMSMW15B | 35.918312 | -83.928259 | | |
| SMSMW08B | SMSMW08B | 35.917805 | -83.927238 | | |
| **Subsurface Soil** | | | | | |
| SMSSPSB01 | SMSSPSB01-XX-XX | -83.927082 | 35.918182 | Screening with XRF, TAL Metals with mercury, Hexavalent Chromium, Cyanide and Chloride | Determine concentration of metals below former pond area subsurface soil |
| SMSSPSB02 | SMSSPSB02-XX-XX | -83.927029 | 35.918111 | | |
| SMSSPSB03 | SMSSPSB03-XX-XX | -83.926952 | 35.918048 | | |
| SMSSPSB04 | SMSSPSB04-XX-XX | -83.926864 | 35.918016 | | |
| SMSSPSB05 | SMSSPSB05-XX-XX | -83.926778 | 35.917979 | | |
| SMSSPSB06 | SMSSPSB06-XX-XX | -83.926679 | 35.918029 | | |
| SMSSPSB07 | SMSSPSB07-XX-XX | -83.926783 | 35.918079 | | |
| SMSSPSB08 | SMSSPSB08-XX-XX | -83.926866 | 35.918116 | | |
| SMSSPSB09 | SMSSPSB09-XX-XX | -83.926948 | 35.91819 | | |
| SMSSPSB10 | SMSSPSB10-XX-XX | -83.927008 | 35.918241 | | |
| SMSSPSB11 | SMSSPSB11-XX-XX | -83.926946 | 35.918285 | | |
| SMSSPSB12 | SMSSPSB12-XX-XX | -83.926862 | 35.918224 | | |
| SMSSPSB13 | SMSSPSB13-XX-XX | -83.926785 | 35.918178 | | |
| SMSSPSB14 | SMSSPSB14-XX-XX | -83.9267 | 35.918128 | | |
| SMSSPSB15 | SMSSPSB15-XX-XX | -83.926593 | 35.918137 | | |
| SMSSPSB16 | SMSSPSB16-XX-XX | -83.926633 | 35.918165 | | |
| SMSSPSB17 | SMSSPSB17-XX-XX | -83.926711 | 35.918215 | | |
| SMSSPSB18 | SMSSPSB18-XX-XX | -83.926783 | 35.91827 | | |
| SMSSPSB19 | SMSSPSB19-XX-XX | -83.926875 | 35.918337 | | |
| SMSSPSB20 | SMSSPSB20-XX-XX | -83.926803 | 35.91838 | | |
| SMSSPSB21 | SMSSPSB21-XX-XX | -83.926718 | 35.918315 | | |
| SMSSPSB22 | SMSSPSB22-XX-XX | -83.926639 | 35.918277 | | |
| SMSSPSB23 | SMSSPSB23-XX-XX | -83.926575 | 35.918221 | | |
| SMSSPSB24 | SMSSPSB24-XX-XX | -83.926523 | 35.918186 | | |
| SMSSPSB25 | SMSSPSB25-XX-XX | -83.926493 | 35.918299 | | |
| SMSSPSB26 | SMSSPSB26-XX-XX | -83.926552 | 35.918355 | | |
| SMSSPSB27 | SMSSPSB27-XX-XX | -83.926617 | 35.918398 | | |
| SMSSPSB28 | SMSSPSB28-XX-XX | -83.926667 | 35.91843 | | |
| SMSSPSB29 | SMSSPSB29-XX-XX | -83.926753 | 35.918487 | | |
| SMSSPSB30 | SMSSPSB30-XX-XX | -83.926686 | 35.918557 | | |
| SMSSPSB31 | SMSSPSB31-XX-XX | -83.926619 | 35.918502 | | |
| SMSSPSB32 | SMSSPSB32-XX-XX | -83.926524 | 35.918464 | | |
| SMSSPSB33 | SMSSPSB33-XX-XX | -83.926469 | 35.918423 | | |
| SMSSPSB34 | SMSSPSB34-XX-XX | -83.926423 | 35.918364 | | |
| SMSSPSB35 | SMSSPSB35-XX-XX | -83.926324 | 35.918421 | | |
| SMSSPSB36 | SMSSPSB36-XX-XX | -83.926377 | 35.918467 | | |
| SMSSPSB37 | SMSSPSB37-XX-XX | -83.926438 | 35.918513 | | |
| SMSSPSB38 | SMSSPSB38-XX-XX | -83.926497 | 35.918555 | | |
| SMSSPSB39 | SMSSPSB39-XX-XX | -83.926564 | 35.918626 | | |
| SMSSPSB40 | SMSSPSB40-XX-XX | -83.926455 | 35.918665 | | |
| SMSSPSB41 | SMSSPSB41-XX-XX | -83.926385 | 35.918604 | | |
| SMSSPSB42 | SMSSPSB42-XX-XX | -83.926324 | 35.918527 | | |
| SMSSPSB43 | SMSSPSB43-XX-XX | -83.926277 | 35.918485 | | |
| SMSSPSB44 | SMSSPSB44-XX-XX | -83.926273 | 35.918623 | | |

**Notes:**
TCL - target compound list
TAL - target analyte list

Table 4-2
Proposed Analytical Method and Sample Summary
Smokey Mountain Smelters
Knoxville, Knox County, Tenneessee

| Sample Matrix | Field Parameters | Laboratory Parameters | Analytical Method | No. of Samples[1] | QA/QC Samples | | | | Total | Lab Assigned | Bottleware and Preservative Requirements | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Field Duplicates | Equipment Rinsate Blanks | Trip Blanks | MS/MSD | | | Number of Containers | Type of Container | Minimum Sample Volume | Preservation | Holding Time |
| Subsurface Soil | XRF | TAL Metals with Mercury | CLP SOW ILM05.4 | 44 | 4 | 2 | NA | 1 | 48 | CLP | 48 | 8 oz. glass | Fill to Capacity | Cool to 4° C | 6 months |
| | | Hexavalent Chromium | Standard methods 3500 CR D | 44 | 4 | 2 | NA | 1 | 48 | SESD | 48 | 8 oz. glass | Fill to Capacity | Cool to 4° C | 24 hours |
| | | Cyanide | EPA 335.4 | 44 | 4 | 2 | NA | 1 | 48 | SESD | 48 | 8 oz. glass | Fill to Capacity | Cool to 4° C | 12 days |
| | | Chloride | EPA 310.2 | 44 | 4 | 2 | NA | 1 | 48 | SESD | 48 | 8 oz. glass | Fill to capacity | Cool to 4° C | 28 days |
| Groundwater | Dissolved Oxygen, Temperature, pH, ORP, Specific Conductance, Turbidity | TAL Metals with Mercury | EPA 6010C / EPA 245.1 | 7 | 1 | NA | NA | 1 | 10 | CLP | 10 | 1 L HDPE | 1 L | Cool to 4° C $HNO_3$ to pH <2 | 180 days |
| | | Hexavalent Chromium | EPA 7199 | 7 | 1 | NA | NA | 1 | 10 | SESD | 10 | 500 mL HDPE | 500 mL | Cool to 4° C buffer | 28 days |
| | | Cyanide | EPA 335.4 | 7 | 1 | NA | NA | 1 | 10 | SESD | 10 | 1 L HDPE | Fill to Capacity | Cool to 4° C | 12 days |
| | | Chloride | EPA 352.2 | 7 | 1 | NA | NA | 1 | 10 | SESD | 10 | 500 mL HDPE | 500 mL | Cool to 4 ± 2° C | 28 days |

**Notes:**
[1]Estimated number of samples based on Draft Work Plan Revision 1, dated September 2015.
ORP - oxidation reduction potential
DO - dissolved oxygen
MS/MSD - matrix spike/ matrix spike duplicate
HDPE - high density polypropylene
TAL - target analyte list
$HNO_3$ - nitric acid